

Amendment and Response

Applicant: Ramiro N. Castellanos et al.

Serial No.: 10/035,592

Filed: October 23, 2001

Docket No.: A126.169.101

Title: SYSTEM AND METHOD FOR INSPECTION USING OFF-ANGLE LIGHTING

IN THE CLAIMS

Please amend claims 1, 11, 21, and 25 as follows:

- 1.(Currently Amended) A system for inspecting components comprising:
 - an axial lighting system illuminating the component with axial lighting to allow one or more features of the component to be located;
 - an off-axis lighting system illuminating the component with off-axis lighting in the absence of the axial lighting to allow the component to be inspected to locate one or more features;
 - an image analysis system receiving image data of the component and analyzing the image data utilizing gradient processing to compare a first gradient value to a second gradient value to locate the one or more features.
- 2.(Previously Presented) The system of claim 1, wherein the image analysis system analyzes a single set of the image data to locate the one or more features.
- 3.(Original) The system of claim 2 wherein the image analysis system further comprises a feature locator system receiving the image data and generating feature edge data.
- 4.(Original) The system of claim 2 wherein the image analysis system further comprises a defect locator system receiving the image data and generating defect indication data from the pixel data.
- 5.(Original) The system of claim 2 wherein the image analysis system further comprises a protrusion analysis system receiving the image data and generating projection size data.
- 6.(Original) The system of claim 2 wherein the image analysis system further comprises a recess analysis system receiving the image data and generating recess analysis data.

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7.(Original) The system of claim 2 wherein the image analysis system further comprises a missing feature system receiving image data and generating missing feature data.

8.(Original) The system of claim 2 wherein the image data further comprises pixel data.

9.(Previously Presented) A system for inspecting components comprising:
an off-axis lighting system illuminating the component with off-axis lighting to allow the component to be inspected to locate one or more features corresponding to a plane of reference, one or more features extending above the plane of reference, and one or more features extending below the plane of reference; and
an image analysis system receiving image data of the component generated when the component is being illuminated with the off-axis lighting and analyzing at least three relative maxima of histogram data generated from the image data to locate the one or more features, respectively.

10.(Original) The system of claim 9 wherein the image analysis system further comprises a feature locator system receiving the image data and generating feature edge data.

11.(Currently Amended) The system of ~~claim 2~~ claim 9 wherein the image analysis system further comprises a defect locator system receiving the image data and generating defect indication data from the image data.

12.(Previously Presented) A method for inspecting a component comprising:
illuminating the component with off-angle lighting to increase the visibility of one or more types of features;
generating image data of the component; and
analyzing at least three relative maxima of histogram data generated with the image data to determine whether any of the one or more types of features are present.

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13.(Original) The method of claim 12 wherein illuminating the component with the off-angle lighting comprises illuminating the component with a circular xenon flash lamp.

14.(Original) The method of claim 12 wherein generating the image data of the component comprises generating an N x M array of pixel data.

15.(Original) The method of claim 12 wherein analyzing the image data to determine whether any of the one or more types of features are present comprises analyzing the image data to determine whether a protrusion is present.

16.(Original) The method of claim 12 wherein analyzing the image data to determine whether any of the one or more types of features are present comprises analyzing the image data to determine whether a recess is present.

17.(Original) The method of claim 12 wherein analyzing the image data to determine whether any of the one or more types of features are present comprises analyzing the image data to determine whether a feature is missing.

18.(Previously Presented) The method of claim 12 wherein analyzing the image data to determine whether any of the one or more types of features are present comprises generating the histogram data from a single set of image data and determining whether the histogram data indicates that a feature is present.

19.(Previously Presented) The method of claim 12 wherein analyzing the image data to determine whether any of the one or more types of features are present comprises generating the histogram data from a single set of image data and determining whether the histogram data indicates that a recess is present.

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20.(Original) The method of claim 12 wherein analyzing the image data to determine whether any of the one or more types of features are present comprises generating the histogram data from a single set of image data and determining whether the histogram data indicates that a protrusion is present.

21.(Currently Amended) A system for inspecting components comprising:
an axial lighting system illuminating the component with axial lighting to allow one or more features of the component to be located;
an off-axis lighting system illuminating the component with off-axis lighting to allow the component to be inspected to locate one or more features; and
a dual lighting analysis system analyzing image data of the component created when the axial lighting system and the off-axis lighting system are ~~both~~ simultaneously illuminating the component and generating component acceptance data.

22.(Original) The system of claim 21 wherein the dual lighting analysis system further comprises a band analysis system receiving edge data and generating band data.

23.(Original) The system of claim 21 wherein the dual lighting analysis system further comprises an edge location system receiving pixel data and generating edge data.

24.(Previously Presented) The system of claim 21 wherein the dual lighting analysis system further comprises a feature analysis system receiving band data and determining whether a feature is present.

25.(Currently Amended) A system for inspecting components comprising:
an axial lighting system illuminating a component with axial lighting to allow one or more features of the component to be located;

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an off-axis lighting system illuminating the component with off-axis lighting in the absence of the axial lighting to allow the component to be inspected to locate one or more features of the component; and

a band analysis system receiving image data of the component and analyzing the image data to identify two or more edges to determine whether a band between the two or more edges identifies the one or more features.